

NACA Space Program

Chris Naccarato

Over the past eleven years my fourth grade students at Priest River Elementary School, Priest River, Idaho and I have worked together to develop the innovative National Astronaut in the Classroom Association (NACA) Science Education Program. NACA has developed from an intriguing idea into a model where fourth grade students formulate ideas, develop theories, exercise initiative, and use the latest technology available to us in scientific inquiry activities. They predict outcomes and, after the fact, scientifically measure results. Perhaps most important, they engage in these learning activities in a highly organized team environment built on the model of NASA Mission Control in Houston.

To elaborate on the model, each student is assigned a specific job (i.e. telemetry, meteorology, telecommunications) that has both individual and small group responsibility for using technology such as GPS systems, radar gun tracking, digital flight imaging, and weather instrumentation to name a few. As Flight Director, it is my task to develop a meaningful job for each student and to tailor each job to fit the individual student's particular learning style and education level. By such tailoring, I find it is possible to provide comfortable access to scientific inquiry for all while ensuring success for every student. I am particularly motivated to see that those who are mentally, physically, or emotionally challenged are given jobs that are important and that bolster both their knowledge and self-esteem.

The NACA Program is broken down into three learning components. First is Flight School. Using flight simulators, Internet, video, and computer software, students are trained in aerodynamics, geometry, Newton's laws, physics and their application to rocketry. Upon completion of this phase, the students earn their "Flight Wings."

The second phase is the Mission Control Simulator, a role playing approach to learning that links instruction to real-life situations. Students learn Mission Control terminology and protocols, follow choreographed procedures, record and use scientific launch data with technological hardware. Working as a team, my fourth graders mimic the environment of Mission Control Houston and of the actual Flight Controllers' jobs at NASA. Education author James Strange and internationally known speaker on how the brain learns best Dr. Deborah Estes both contend that linking instruction to real life situations highly increases learning and retention.

The final area is the live-fire model rocket launch overseen by a NASA Astronaut. In the past eleven years, NACA has brought fourteen astronauts and one cosmonaut to Priest River for the scientific benefit of my fourth grade students and other students in our area. During this annual event the students display their simulator training to the Astronaut visitor who also serves as an evaluator of their performance as a Mission Control Team. Having an Astronaut present adds an element of realism and inspiration that far surpasses what any video or textbook could ever provide.

After the launch the NACA Program uses a NASA-like Flight Mishap Simulation Facility where damaged launch vehicles and rockets are dismantled, analyzed and any launch or in-flight mishaps are reconstructed to determine cause and future mitigation. It is here that the students problem-solve issues that arose during the launch and flight. I cannot overstate the importance of up-to-date technology to the NACA success story.

From space there are no borders, you cannot see where one country ends and another begins." Astronaut Ellen Baker's quotation aptly captures the NACA philosophy: Technology clears a pathway to a borderless integrated learning environment which, in turn, serves as an incubator for the development of good students and future scientists.

"Aspire to inspire." is a quotation by Astronaut Dr. Yvonne Cagle captures the heart of my belief about how an exemplary educational program should use technology to positively and aggressively impact students' performance.

The NACA Program uses the concept of space exploration to provide a hook which gets students excited about learning and technology. The diverse nature of space exploration allows it to be adapted to and incorporated into any subject in the academic curriculum. Besides the many math and science concepts inherent in the NACA Program, the space theme is also readily applicable in social studies, reading, geography, history, fine arts, physical education, language arts, first aid, health, and safety. I would go so far as to say that technology also aids in the development of manners, etiquette, and structured discipline given that NACA students emulate the procedures and protocols of Mission Control in Houston and take very seriously their roles in the NACA Space Program.

To its credit, the NACA approach has helped Priest River Elementary to increase scores on national standardized tests (ISAT, NAEP, ITBS), and state mandated exams (DMA, DWA). The NACA Program's exciting curriculum pinnacles students' interests enticing them to attend school. For this reason, NACA has consistently contributed to keeping my schools average daily attendance rate at 94.5% which is higher than the state expected level of 93%. As an added benefit, over NACA's eleven years, I have seen a six NACA students follow the interest they gained from the program by attending U.S. Space Camps in Alabama and California. Each of the NACA students received superior marks in teamwork and space knowledge skills, two foundational principles of NACA training.

I am confident that the NACA experience enhances my students' performance because I use a performance-based evaluation which focuses on 1) how well a given task is completed and understood, and 2) how well students transition from one task to another. In my NACA lessons, I use both of these evaluation benchmarks to assess understanding of concepts that I have targeted. I organize, train, and teach students about working as a team, and using technology as a tool to enhance the performance of that team. At the end of each training session the Flight Controllers and I step into the role of reflective practitioners and review the video technology footage of the

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launch or simulation being conducted, much like a quarterback who studies films after a game to look for positive or negative behaviors that affected the team's performance.

I also employ constant reflection upon methods and materials to improve my own Flight Director performance and my lessons' impact on students' learning. By continually placing myself in the role of a learner, and seeking the counsel of educators, parents, astronauts, and students, I have been able to improve technology use in the NACA program. NASA-Houston's Flight Controllers rarely exhaust their potential use of in-flight skills, but rely on realistic simulations using technology to stay prepared. In similar fashion, I employ multiple applications of technology in the NACA Program to keep my Flight Controllers skilled and ready.

In the final analysis, the measure of any educational program's success is how well it meets the needs of its students. Supported by these data cited above, I can state confidently that the NACA Program has enhanced the performance of my Priest River fourth graders and has further incorporated the use technology in a unique and effective manner in the education of children, and the creation of tomorrow's scientists. I want them to learn and to love learning.

In the television show *Tool Time*, comedian Tim Allen is constantly making adjustments to his tools that cause them to be packed with incredible power, usually with comedic results. My fourth grade and I are also seeking more power, but for the purpose of broadening and enriching the space exploration model that is the organizational motif of their science experience at Priest River Elementary. By adding newer technology to our existing NACA Program's inventory, we will "power up" the educational program or, as Tim Allen puts it, "Tweak It" to higher levels of performance, achievement, and educational excitement. That's real power!

In 1993 I began implementing the NACA Space Program into my academic curriculum. I felt that as an educator it was my job to teach my students the concept of accomplishing a goal or establishing a dream and then working toward achieving it. I wanted them to see how hard work and dedication will empower their minds and character. Additionally, I believed that by using technology, students would be much more likely to receive a strong foundation in all subject areas, especially the basic skills—thus NACA science and space exploration in Priest River fourth grade was born.

The wonderful thing about the NACA Program is that it has given me a vehicle for starting students on their road to success. I had become increasingly concerned about reports of students slipping through the cracks in the educational system and entering high school without learning even the most basic of skills. This comes at a time when America needs to maintain its technological advantage over the rest of the world. NASA scientists are concerned that the number of students graduating with science degrees is decreasing. On average America is graduating 60,000 scientists a year, and China 6,000,000. This alarming differential is a clear indicator that teachers need to focus on developing and nurturing more scientific aspiration in our students. Students need to be made aware that great career opportunities are open to them in the field of science. Even though the No Child Left Behind Act (NCLB) is making great strides in combating this issue, still the problem does exist in schools today.

Technology, in my opinion, can play a huge role in correcting this deficiency. I know from eleven year's personal experience that any program, NACA for example, that inspires children to learn and captures and holds their interest will increase the amount of effective time that they spend in the classroom thus reducing the slippage problem.

Technology by Webster's definition is the use of science in solving problems. One reason the NACA program has been so successful is that it uses technology innovatively to bolster student learning. This year my school district has adopted a new science curriculum that was in part co-written by NASA, the model for NACA. I served on the textbook adoption committee for my district, and feel that this program will offer students an excellent science education with a strong emphasis on technology. It is also aligned with district, state, and national Science Content Standards and fits very well with the NACA Program, particularly if we are able to add to and upgrade our current equipment.

The technology that I intend to purchase as a result of this grant will improve the fit of NACA with the district's new science curriculum and will enhance instruction of the lessons being taught. This technology can also be used by other students and instructors at different grade levels who may wish to enhance their lessons in science as well. The introduction of this new technology to my NACA Program will give my Flight Controllers "More Power" thus, allowing them to go Higher, Faster, and Farther in pursuit of a scientific goal or career. Tim Taylor redux.

In 2004 Governor Kempthorne of Idaho and the Priest River Elementary PTO each awarded the NACA Mission Control Simulator an innovative educational grant. We happily used the money to purchase technology to help my Flight Controllers take more accurate scientific measurements during indoor and outdoor model rocket launches. If awarded a Qwest Foundation Grant in 2005, the equipment I purchase will be user friendly, but challenging for the fourth graders trained in the NACA Program. Specifically, it will interface with existing NACA technology, and take readings or measurements that are vital to a launch. For example, getting reliable weather data ahead of the scheduled launch will increase the control the Flight Controllers can exercise over the launch event.

A portion of Qwest Grant funds will support an appearance by Chief Skylab 4 Scientist and NASA Astronaut Dr. Edward Gibson who will officiate at the annual NACA springtime launch event serving as an evaluator of the NACA Flight Control Teams. (The NACA Program has raised \$3,000 of the expected \$5,000 Astronaut appearance stipend.) He will also speak to students, teachers, and parents throughout our area about the science and

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technology involved in the Skylab Project plus other innovations that NASA is currently working on. His talk will offer encouragement and information for teachers involved with my district's newly adopted science program.

Quest funding will also permit NACA to purchase a notebook computer so that we can create a Mission Control Technology Center that I (and other teachers) can use to generate simulations and record data with students. The computer will also allow me to share the S.T.A.R.S. (Space Exploration Power Point) that I developed with other classes and schools to inform them about the wonders of space technology now and in the past. The printer and scanner I request will enable updates to S.T.A.R.S. program to maintain currency.

The television, merged with the laptop, digital video camera, and digital still camera will move my classroom and school away from the limiting analog system that is currently in place. The digital cameras will also permit me to document methods of instruction which may be useful to other educators. The wireless weather center will be a great improvement over the handheld system we use now.

Astronaut Gordon Cooper once stated, "Public funding is a major component that allows NASA to operate, 'No bucks, No Buck Rogers.'" The students of the NACA Program diligently work the entire school year so they can meet the modern equivalent of Buck Rogers at the spring launch event. A Qwest Grant for technology will allow the NACA students the opportunity to see and possibly one day to become their generations Buck Rogers.

In the Steven Spielberg movie entitled *The Goonies*, a father who makes his living inventing and selling his gadgets proudly tells his son, "You are my best invention!" As Flight Director of the NACA Space Program, the enhanced learning environment I seek is made possible by improved technology. It is this technology that allows my fourth graders to soar like the rockets they launch in the live fire phase of the program. And at the end of a successful firing, the trajectory calibrated, the rocket recovered, the flight assessment done in the presence of a real-life astronaut, I look at my young Flight Controllers, enlightened and excited about learning, flushed with pride over their achievement, and I say, not a little pridefully myself, "You are my best invention!"

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Activity	100	200	300	400	500	TOTAL
	Salaries	Benefits	Contractual Agreements	Materials and Supplies	Capital Objects	
Astronaut Apperance Fee			\$2,000.00			\$2,000.00
Splash Software				\$130.00		\$130.00
Roksim Software				\$99.95		\$99.95
Eagle Systems Software				\$149.99		\$149.99
Altimeter					\$75.00	\$75.00
Notebook Computer					\$996.00	\$996.00
Printer/Scanner/Copier					\$128.88	\$128.88
TV/VCR/DVD Player					\$259.00	\$259.00
Digital Camcorder					\$238.74	\$238.74
Digital Camera with Dock					\$298.44	\$298.44
Wireless Weather Station					\$214.95	\$214.95
Total			\$2,000.00	\$379.94	\$2,211.01	\$4,590.95